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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte BRANDON W. BLACKBURN

Appeal 2009-003097
Application 09/360,582
Technology Center 3600

Decided: March 31, 2010

Before: JENNIFER D. BAHR, JOHN C. KERINS, and STEVEN D.A. McCARTHY, *Administrative Patent Judges*.

BAHR, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Brandon W. Blackburn (Appellant) appeals under 35 U.S.C. § 134 (2002) from the Examiner's decision rejecting claims 1, 4, 5, 7, and 8, which are the only claims pending in the application. We have jurisdiction over this appeal under 35 U.S.C. § 6 (2002).

The Invention

Appellant's claimed invention is directed to high powered accelerator based neutron sources having liquid cooled targets. Spec. 2:6-7.

Claim 8, reproduced below, is illustrative of the claimed subject matter.

> 8. A liquid cooling system for a neutron source assembly, said cooling system comprising:
>
> a reservoir of liquid gallium;
>
> a heat exchanger;
>
> a nozzle, said nozzle being submerged in liquid gallium, providing a submerged jet of concentrated liquid gallium in a direction normal to a non-bombarded surface of a low Z target material within the neutron source assembly; and
>
> means for serially circulating said liquid gallium from said reservoir through said nozzle to impinge upon said surface of the low Z target material within the neutron source assembly, from the neutron source assembly directly to said heat exchanger, and from said heat exchanger to said reservoir.

The Rejections

Appellant seeks review of the Examiner's rejection of claims 1, 4, 5, 7, and 8 under 35 U.S.C. § 112, first paragraph, as containing subject matter not described in the specification in such a way as to reasonably convey to one skilled in the art that Appellant had possession of the claimed invention at the time the application was filed (i.e., as failing to comply with the written description requirement); and of claims 1, 4, 5, 7, and 8 under 35 U.S.C. § 103(a) as being unpatentable over Eggers[1], Lidsky[2], Pais[3], and Alger[4].

SUMMARY OF DECISION

We AFFIRM.

OPINION

The written description rejection

The Issue

The Examiner asserts that the limitation in each of the independent claims 1, 5, and 8 with respect to the nozzle being submerged in liquid gallium is not described in the application as originally filed so as to satisfy the written description requirement of 35 U.S.C. § 112, first paragraph. Ans.

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[1] US Patent 5,392,319, issued Feb. 21, 1995.
[2] US Patent 5,784,423, issued Jul. 21, 1998.
[3] M. R. Pais et al., *Single-Phase Heat Transfer Characteristics of Submerged Jet Impingement Cooling Using JP-5*, 1994 InterSociety Conference on Thermal Phenomena, 178, 178-83 (IEEE 1994).
[4] US Patent 4,141,224, issued Feb. 27, 1979.

4. The claims were amended to incorporate this limitation in the Amendment filed September 26, 2006.

Appellant contends that original figure 2 shows an outlet 30 located above the top surface of the beryllium target 32. App. Br. 6. Appellant also points out that the Specification, at the time the application was filed, "at page 6, lines 7-8, explicitly states that liquid gallium fills the chamber 40 and exits therefrom." *Id.* Thus, Appellant reasons that "the chamber must be filled with liquid gallium before exiting" because otherwise "the chamber will never fill." *Id.* According to Appellant, absent statements to the contrary, the teaching that the chamber is filled with liquid gallium conveys that it is entirely, or completely, filled, not partially filled. *Id.* Therefore, Appellant argues that "the originally filed specification teaches that the jet of liquid gallium 37 is submerged in the reservoir 40 because the reservoir 40 is filled with liquid gallium." *Id.*

Appellant additionally relies upon the disclosure in the Specification, at the time the application was filed, of testing with a water coolant using a submerged jet impingement configuration (*see* Spec. 6:17-19) as supporting the submerged nozzle limitation. App. Br. 7.

Accordingly, the issue before us is whether the illustration in Appellant's figure 2, the disclosure that "[t]he liquid gallium fills chamber 40 and exits to the heat exchanger 24" (Spec. 6:11-12), and disclosure of initial tests using water coolant "in a submerged jet impingement configuration" (Spec. 6:17-19) are sufficient to satisfy the written description requirement for the submerged nozzle limitation in independent claims 1, 5, and 8.

Discussion

The description requirement found in the first paragraph of 35 U.S.C. § 112 is separate and distinct from the enablement requirement of that provision. *Ariad Pharm., Inc. v. Eli Lilly and Co.*, --- F.3d ----, 2010 WL 1007369, at *12 (Fed. Cir. 2010) (*citing Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1562-63 (Fed. Cir. 1991)). The purpose of the written description requirement in 35 U.S.C. § 112, first paragraph, is to "'clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed.'" *Id.* "[T]he test for sufficiency is whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Ariad*, 2010 WL 1007369 at *12. This test "requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art." *Id.* "Based on that inquiry, the specification must describe an invention understandable to that skilled artisan and show that the inventor actually invented the invention claimed." *Id.* This inquiry is a question of fact. *Id.* (*citing Ralston Purina Co. v. Far-Mar-Co, Inc.*, 772 F.2d 1570, 1575 (Fed. Cir. 1985)).

We find that Appellant's Specification describes figure 2 as "a cross sectional illustration of a portion 30 of the accelerator based neutron source 12." Spec. 6:3-4; *see also* Spec. 5:7-8. Appellant's Specification, however, does not indicate the plane upon which the cross sectional illustration is taken. *See* 37 C.F.R. § 1.84(h)(3) (2007). Consequently, it cannot be determined whether the section illustrated in figure 2 is taken along a horizontal plane, a vertical plane, or some other orientation, or whether the view is from above, below, to the left of, or to the right of the section plane.

Moreover, Appellant's reference to "the outlet 30" (App. Br. 6) is not supported by the Specification, which uses the reference numeral 30 to denote a portion of the accelerator based neutron source 12, not the outlet from the chamber 40. Appellant's Specification does not identify any structure in figure 2 as the outlet, or exit, through which the liquid gallium exits chamber 40. While figure 2 appears to depict some sort of opening or port structure proximate the lead line for the reference numeral "30," there is no indication in either figure 2 or the accompanying description in the Specification that this structure is the outlet from chamber 40, through which the liquid gallium exits the chamber, rather than, for example, an inlet port for admission of purge gases, or some other structure. Thus, Appellant's figure 2 and the accompanying description of figure 2 in the Specification do not reasonably convey that the liquid gallium must rise to a level above the nozzle 34 prior to exiting the chamber 40.

We find that figure 2 is sufficient to convey that the nozzle 34 is disposed within chamber 40 of the accelerator based neutron source 12. We do not find, however, that the disclosure that "[t]he liquid gallium fills chamber 40 and exits to the heat exchanger 24" (Spec. 6:11-12) is sufficient to reasonably convey that the liquid gallium completely fills the chamber 40, as urged by Appellant, such that all structures located within the chamber 40 are submerged in the liquid gallium. Appellant urges, in essence, that the plain meaning of this disclosure excludes a partial filling, and, in the absence of further statements to the contrary, requires complete filling of the chamber. *See* App. Br. 6. Appellant has not shown, however, that the term "fill" has established such a plain meaning in the art, such that a person of ordinary skill in the art would understand that the teaching "[t]he liquid

gallium fills chamber 40 and exits to the heat exchanger 24" excludes a filling of only part of the capacity, or volume, of the chamber. Moreover, as explained more fully below, our findings do not indicate that the term "fill" has established such a meaning in the art.

While we find dictionary definitions of "fill" that support Appellant's assertion that "fill" means to fill the entire capacity or volume, we also find dictionary definitions that suggest a broader meaning of "fill" that would encompass filling to less than the entire capacity. *See, e.g., Webster's New World College Dictionary* (2009), http://www.yourdictionary.com/fill (last visited Mar. 30, 2010) (defining "fill" as "*a)* to put as much as possible into; make full *b)* to put a considerable quantity of something into [to fill the tub for a bath, to fill one's life with joy]"). As noted above, compliance with the written description requirement is viewed from the perspective of a person of ordinary skill in the art. Thus, given the different established meanings of the term "fill" generally, the relevant inquiry is whether this term has established an unambiguous meaning in the art in accordance with the Appellant's asserted definition. We find that Alger evidences that this is not the case. Specifically, Alger discloses that liquid coolant "*fills* the chamber 13." Col. 2, ll. 47-49 (emphasis added). Alger's description of the operation of float switch 37 and baffles 41 (col. 2, ll. 40-57), and their depiction in figure 1, however, suggest that the liquid coolant does not fill the entire volume of the chamber 13 prior to the float switch reaching its up position.

Finally, even assuming that a person of ordinary skill in the art would have understood from Appellant's Specification that the disclosure in Appellant's Specification of initial tests using water coolant "in a submerged jet impingement configuration" (Spec. 6:18-19) applies equally to the

embodiment of the invention using liquid gallium as the coolant, this disclosure is insufficient to convey that the *nozzle* 34 of Appellant's invention is submerged in liquid gallium, as now required in each of independent claims 1, 5, and 8. As pointed out by the Examiner on page 4 of the Answer, "'submerged jet' does not necessarily mean 'submerged nozzle.'" We find that Pais evidences that the terminology "submerged jet" (whether "partially" submerged or "fully" submerged) was used in the art to describe a jet that travels, for at least some distance, through a pool of liquid on its way to the surface to be cooled, as distinguished from a "free jet," which travels through air, or other gas, on its way to the surface to be cooled. *See* Pais, p. 178, Abstract and figure 1, p. 182 (distinguishing submerged nozzle scenarios from submerged or flooded surface scenarios, defining "free jet impingement" cooling as a scenario wherein the liquid height above the surface is 0 mm, distinguishing the "free jet" case from the case of a flooded surface, and characterizing scenarios other than the "free jet" scenario as "submerged jet" scenarios). In accordance with such usage, a "submerged jet impingement configuration" describes either a configuration in which the nozzle and jet are submerged (a "fully submerged" configuration) or a configuration in which the jet is either fully or partially submerged, but the nozzle is not submerged. Accordingly, we find that that disclosure of "a submerged jet impingement configuration" would not convey that the nozzle, as well as the jet, necessarily is submerged in liquid gallium.

Further, while a person of ordinary skill in the art might envision a submerged nozzle as one possible embodiment of Appellant's invention, this is not sufficient to satisfy the written description requirement. When an

explicit limitation in a claim "is not present in the written description whose benefit is sought it must be shown that a person of ordinary skill would have understood, at the time the patent application was filed, that the description requires that limitation." *Hyatt v. Boone*, 146 F.3d 1348, 1353 (Fed. Cir. 1998).

> To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.' 'Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'

In re Robertson, 169 F.3d 743, 745 (Fed. Cir. 1999) (citations omitted).

Conclusion

The illustration in Appellant's figure 2, the disclosure that "[t]he liquid gallium fills chamber 40 and exits to the heat exchanger 24" (Spec. 6:11-12), and disclosure of initial tests using water coolant "in a submerged jet impingement configuration" (Spec. 6:17-19) are insufficient to satisfy the written description requirement for the submerged nozzle limitation in independent claims 1, 5, and 8. We sustain the Examiner's rejection of claims 1, 5, and 8, as well as claims 4 and 7, which depend from claims 1 and 5.

The obviousness rejection

The Issue

Each of independent claims 1, 5, and 8 requires either a step of pumping (claim 1) or a means for serially circulating (claims 5 and 8) the liquid gallium from the reservoir through the nozzle to impinge upon the surface of the low Z target material within the neutron source assembly,

from the neutron source assembly *directly* to the heat exchanger, and from the heat exchanger to the reservoir. The Examiner finds that Eggers does not satisfy this limitation. Ans. 7, 10, and 13. In order to overcome this deficiency, the Examiner seemingly proposes to modify Eggers by incorporating the cooling fluid circulation arrangement taught by Alger, comprising reservoir 23, heat exchanger 28, an accelerator based neutron source 11, pump 27, and nozzle 29 (*see* Alger, figs. 1 and 2) into the system of Eggers to circulate, and re-circulate, the cooling fluid. *See* Ans. 7, 10-11, and 13-14.

Appellant argues that Alger discloses pumping the cooling fluid from the neutron source assembly directly to the reservoir, from which the fluid may travel directly back to the pump or may travel to a heat exchanger to remove heat from the coolant. App. Br. 14. Thus, according to Appellant, Alger "unequivocally, fails to disclose or suggest pumping the liquid gallium, serially, from the neutron source assembly directly to a heat exchanger to remove heat from the liquid gallium, and from the heat exchanger to the reservoir." App. Br. 15 (emphasis in original).

In response, the Examiner asserts that in light of Appellant's disclosure of components 26 and 28 (*see* fig. 1), the term "directly" in claims 1, 5, and 8 cannot be construed in the sense of "'without any component interposed.'" *See* Ans. 18.

Accordingly, an issue raised in this appeal is whether the Examiner has established that the combined teachings of Eggers, Lidsky, Pais, and Alger render obvious a means for or step of serially circulating the liquid gallium in Eggers' system from the accelerator based neutron source

"directly" to the heat exchanger and from the heat exchanger to the reservoir, as called for in claims 1, 5, and 8.

Discussion

When claim terminology is construed in the United States Patent and Trademark Office, claims are to be given their broadest reasonable interpretation consistent with the specification, reading claim language in light of the specification as it would be interpreted by one of ordinary skill in the art. *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004).

We find that ordinary and customary usages of the term "directly" are "1. in a direct way or line; straight 2. with nothing or no one between" *Webster's New World College Dictionary* (2009), http://www.yourdictionary.com/directly (last visited Mar. 30, 2010). We further find that Appellant's Specification and figure 1 describe a pumping/circulation system in which the liquid gallium flows from the accelerator based neutron source 12 through a heat exchanger 24, without first flowing into any other component of the fluid cycle between the accelerator based neutron source 12 and the heat exchanger 24, and back to the reservoir 14. Spec. 5:18-19. While Appellant discloses that a pressure sensor 26 is used to monitor the pressure of the liquid gallium as it flows from the accelerator based neutron source 12 to the heat exchanger 24 (Spec. 5:19-20), such pressure monitoring does not divert, interrupt, or significantly alter the flow of the liquid gallium, and thus is not an active component of the circulation system.[5] As such, we find that the underlying disclosure in

[5] Appellant also describes a check valve 28 disposed in the flow line between heat exchanger 24 and reservoir 14. Spec. 5:20-21; fig. 1. This is

Appellant's Specification and figure 1 is consistent with usage of the term "directly" in accordance with its ordinary and customary meaning of straight, with nothing or no one between. Appellant's underlying disclosure does not reasonably invite the broad construction of "directly" applied by the Examiner (Ans. 18). *See Stumbo v. Eastman Outdoors, Inc.*, 508 F.3d 1358, 1362 (Fed. Cir. 2007) (denouncing claim constructions which render phrases in claims superfluous).

We find that Alger describes a closed loop system for circulating a liquid coolant, wherein the coolant is pumped from isothermal reservoir 23, by means of pump 27, to nozzle 29 into chamber 13 for cooling accelerator target 11, then from chamber 13 back to reservoir 23. Figs. 1 and 2. The liquid coolant does not flow through the cooling system 28 (the heat exchanger) until after it has returned to the reservoir. *Id.* Thus, we find that Alger does not describe circulating liquid coolant serially from a reservoir to the accelerator based neutron source, from the accelerator based neutron source directly to a heat exchanger, and from the heat exchanger to the reservoir. The Examiner has not relied on any of Eggers, Lidsky, or Pais in addressing the limitations in claims 1, 5, and 8 directed to such serial circulation. Further, the Examiner has not cogently explained how Eggers would be modified in view of Alger's circulation system so as to satisfy these limitations, other than by essentially reading the term "directly" out of the claim.

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not relevant to the construction of the term "directly," however, as none of the claims calls for the liquid gallium to be circulated directly from the heat exchanger to the reservoir.

Conclusion

The Examiner has failed to establish that the combined teachings of Eggers, Lidsky, Pais, and Alger render obvious a means for or step of serially circulating the liquid gallium in Eggers' system from the accelerator based neutron source "directly" to the heat exchanger and from the heat exchanger to the reservoir, as called for in claims 1, 5, and 8. We do not sustain the rejection of claims 1, 5, and 8, or claims 4 and 7, which depend from claims 1 and 5, respectively.

DECISION

The Examiner's decision is AFFIRMED.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv) (2007).

AFFIRMED

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